Available online at www.sciencedirect.com

ScienceDirect

Procedia - Social and Behavioral Sciences 110 (2014) 1073 – 1081

Procedia
Social and Behavioral Sciences

Contemporary Issues in Business, Management and Education 2013

Factor returns in the Polish equity market

Adam Zaremba[a]*, Przemysław Konieczka[b]

[a] *Poznań University of Economics, al. Niepodległości 10, 61-875 Poznań, Poland*
[b] *Warsaw School of Economics, al. Niepodległości 162, 02-554 Warszawa, Poland*

Abstract

The ability to indicate factors which best explains common variation in stock returns, is crucial to construction of a correct pricing model and forecasting equity returns. Taking into account long finance literature, firm characteristics such as market capitalization, book-to-market ration, the short-term history of past returns, or market turnover are important determinants of stock returns. This study seeks to identify factors important for forecasting changes in stock prices in Poland. The paper examines the relationships between common stock returns and four well-recognized factors: size, value, momentum and liquidity. First, we review existing literature in the field. Second, we investigate the relationship between fundamental factors and stock returns in the Polish market. We study also interactions between separate factors. We perform a long/short portfolio analysis based on all stocks listed on the Warsaw Stock Exchange between 2000 and 2012. We find that historically in Poland it was possible to build factor-based portfolios which outperformed the broad market. However, the Polish market seems too young to derive some significant statistical interference.

Keywords: factor returns; momentum; size; value; liquidity.

Introduction

The paper examines the relations between selected company fundamentals and common stock returns. Taking in to account long finance literature, firm characteristics such as market capitalization, the ratio of book equity to market equity, the short-term history of past returns and daily turnover are important determinants of stock returns. The aim of the study is to confirm existence of relationship between fundamental factors and stock return patterns.

* Corresponding author: *adam.zaremba@ue.poznan.pl*.

doi:10.1016/j.sbspro.2013.12.954

In the paper, we concentrate on four well-recognized fundamental factors determining stock returns: momentum, value, size and liquidity. First, we review existing literature in the field. Second, we investigate the relationship between fundamental factors and stock returns on the Polish market. Besides separate characteristics, we focused also on interactions between various factors.

Our computations are based on all companies on the Warsaw Stock Exchange listed in the period 2000-12[†].

1. Return factors in the global markets – research survey

The relations between an asset's return and varied factors have been the most studied capital market phenomena over the past century. The capital asset pricing model presented and developed by Sharpe (1964), Lintner (1965) and Black (1972) has shaped for long time in what way scientists and financiers understand the relationship between average return and risk. However, the growing empirical evidence demonstrated the inefficiency of market factor suggested in fully explaining security prices, as suggested by CAPM. As a consequence, researchers attempted to identify company characteristics, which explain differences in common stock returns. Amongst these firm attributes the most prominent ones are: capitalization (size of company), the ratio of book equity to market equity (value of company), the short-term history of past returns (momentum) and daily turnover (liquidity of company stocks). Fama and French (1993) introduced to CAPM model value and size factors, based on individual stock characteristics. Following Fama and French (1993), other factors have been proposed in the literature and introduced to asset pricing models (most notably the momentum factor or liquidity factor) to examined these occurrence in stock returns.

In this part, we provided a brief overview of the momentum, value, size and liquidity factors and summarized the evidence for all of these.

1.1. Momentum factor

The momentum factor is based on the observation by Jagadeesh and Titman (1993) that stocks with a high past performance (winners) outperforms stocks with a low past performance (losers) in the short-term horizon. The momentum strategy relay on buying the winner portfolio and shorting the loser portfolio.

The initial study of this patterns in stock returns was the work of DeBondt and Thaler (1985). They found strong evidence that recent good performing stocks become poor performers over 3-year and 5-year holdings. Jagadeesh and Titman (1993; 2001) performed an analysis similar to DeBondt and Thaler (1985) but with focus on a short-term investment horizon.

The evidence of momentum factor in returns of stocks in the international markets was proved by Asness (1994), Fama and French (1998, 2011), Rouwenhorst (1998), Liew and Vassalou (2000), Griffin, Ji, and Martin (2003), Grinblatt and Moskowitz (2004), Chui, Wei, and Titman (2010), Asness, Moskowitz, and Pedersen (2013).

There is also evidence, that momentum effect can be effectively combined with value factors and size factors (Fama & French 2012; Asness, Moskovitz, & Pedersen 2013).

1.2. Value factor

The value factor derived from a value effect research. The value effect is tendency of value stocks (stocks with low prices relative to their fundamentals) to outperform growth stocks (stocks with high prices relative to their fundamentals. Alternative value measures used in the literatures are:

- B/M – the book value of equity divided by the market value of equity,
- E/P – the earnings after taxes divided by the market value of company's shares,
- past sales growth – the compounded growth rate in net sale for three years prior to portfolio formation.

[†] Parts of research published in this paper were also presented in Zaremba and Konieczka (2013a, 2013b).

Formal statistical evidence of the value effect were presented by Stattman (1980) and Rosenberg (1985). They used the book to market ratio as a value indicator. Davis *et al*. (1994) confirmed the value effect in US stock markets. Chan *et al*. (1991) and Capaul *et al*. (1993) confirmed the value effect, but in outside the US markets.

The value effect was observed in stocks returns by Chan, Hamao and Lakonishok (1991), Fama and French (1998, 2011), Rouwenhorst (1999), Lam (2002), Ghargohori (2009), Chui, Titman, and Wei (2010), Asness, Moskowitz, and Pedersen (2013).

The value effect seems to be particularly strong among small-stocks.

1.3. Size factor

The size factor is related to the size effect, which was firstly documented by Banz (1981). Banz found that the smallest 20 per cent of firms earn an annual return that is 5 per cent higher than the return on other firms. In the other words, he showed that stocks with lower capitalization (small stocks) tend to have higher average returns. Banz carried out the research into return premium on small stocks during the 1936 – 1975 period for the stocks quoted on the NYSE.

In the literature are a variety of ways in which one can measure company size:

- market capitalization – the market price of the company's share multiplied by number of shares outstanding,
- total asset – the book value of total asset,
- enterprise value – the market value of equity plus book value of net debt,
- net sales – the difference between gross sales and sales returns.

Reinganum (1981) and Cook and Roseff (1982) confirmed the evidence of the size effect by using a broader sample and decile portfolios. The size effect was later confirmed by Blume and Stambaugh (1983) and Brown *et al*. (1983). In particular, the size effect was detected in US markets and several international markets by a variety of researchers (Herrera & Lockwood, 1994; Heston, Rouwenhorst, & Weessels, 1999; Rouwenhorst, 1999; Horowitz, Loughran, & Savin, 2000a; Fama & French, 2008; Michou, Mouselli, & Stark, 2010).

However, Fama and French (2011) did not find the size premium in any of four global regions after examining returns over a 20-year horizon starting in 1990. Dimson *et al*. (2011) observed that higher returns of smaller companies did not exist for long periods of time.

1.4. Liquidity factor

The paper of Amihud and Mendelson (1986) broke ground to various studies showing that liquidity may be the relevant factor that explains stock returns. The rationale behind is that illiquidity can be measured as costs of immediate execution and an investor willing to transact at a favorable price faces a trade-off.

A large part of existing literature confirms the presence of a liquidity effect on the US stock market (Amihud & Mendelson, 1986; Brennan & Subrahmanyam, 1996; Haugen & Baker, 1996; Chalmers & Kadlec, 1998; Datar, Naranyan, & Radclie, 1998; Brennan, Chordia, & Subrahmanyam, 1998; Chordia, Roll, & Subrahmanyam, 2001; Garleanu, 2009). The evidence for liquidity effect in international market was confirmed by Amihud *et al.* (1997), Hu (1997), Chan and Fa (2005).

2. Return factors in the global markets – research survey

We investigated the issue of returns to momentum, value, liquidity and size factors in the Polish market based on all stocks listed on the Warsaw Stock Exchange 30.11.2000 and 30.11.2012. The data came from Bloomberg. We used both listed and delisted stocks in order to avoid the survivorship bias.

We divided the stocks into three separate equal-sized groups' classes on their fundamental characteristics:

- V = value factor (book to market value ratio),
- S = size factor (market capitalization),

- M = momentum factor (annual rate of return excluding dividends for the 12 months preceding the 30th of November given year,)
- L = liquidity factor (average daily turnover over the past month).

We used only these stocks, which had all four computable characteristics in a given year. The number of stocks in the sample grew along with the development of Polish capital market from 36 in the beginning of the research period to 423 in the end.

Based on these characteristics, we constructed equal-weighted portfolios, which were reconstructed once a year on the 30th of November. The date was chosen intentionally in order to avoid look-ahead bias.

Next, we constructed long/short portfolios for each characteristic compounded of a long position in the highest-class portfolio and a short position in the lowest-class portfolios. In other words, we built 4 portfolios:

- V long/short portfolio:100% long in the highest book-to-market ratio and 100% short in the lowest book-to-market ratio,
- S long/short portfolio:100% long in the smallest stocks and 100% short in the biggest stocks,
- M long/short portfolio:100% long in the highest momentum stocks and 100% short in the lowest momentum stocks,
- V long/short portfolio:100% long in the most liquid stocks and 100% short in the least liquid stocks.

Finally, the performance of long/short portfolios were tested against two models: market model and CAPM (Cambell, Lo, & MacKinlay, 1997; Cochrane, 2005). The first one was the classical market model.

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it},\ E(\varepsilon_{it}) = 0,\ \mathrm{var}(\varepsilon_{it}) = \sigma_\varepsilon^2 \tag{1}$$

where R_{it} and R_{mt} are the period-t returns on security and the market portfolio, ε_{it} is the zero mean disturbance term and α_i, β_i and $\sigma_{\varepsilon\wedge 2}$ are the parameters of the market model. We employed average cross-sectional returns of all stocks in the sample as the proxy for market portfolio. We took such approach in order to be consistent with the portfolios' equal weighting methodology.

The other model we employed was Capital Asset Pricing Model. The long/short portfolios excess returns were regressed on market portfolio excess returns, accordingly to CAPM equation

$$R_{pt} - R_{ft} = \alpha_i + \beta_i (R_{mt} - R_{ft}) + \varepsilon_{pt} \tag{2}$$

where R_{pt}, R_{mt} and R_{ft} are annual long/short portfolio, market portfolio and risk-free returns, and α_i and β_i are regression parameters. We used 1-year WIBID rates to represent the risk-free rate. The α_i intercept measures the average annual abnormal return (so called Jensen-alpha). In both models, our zero hypothesis is that the alpha intercept is not statistically different from zero, and the alternative hypothesis states that it is actually different from zero. We found the equation parameters using OLS and tested them in both parametric and non-parametric (bootstrap) way.

Next we decided to investigate the interactions between single factors. We decided here to omit the liquidity factor as it was closely correlated with the size factor. We divided the stocks into separate groups based on combinations of their fundamental characteristics described above: V, S and M. We did it as follows. Firstly, we ascribed each stock to one of the tertiles created based on the fundamental factors above. In other words, we segregated all the stocks into low, medium or high V, low, medium or high S, and low, medium or high M. Secondly, nine portfolios for each pair combination of two of the mentioned fundamental factors. For instance, in case of pair V+S, we created low V and low S portfolio, which consisted of stocks that belonged simultaneously to low V tertile and low S tertile; low V and medium S portfolio, which consisted of stocks that belonged simultaneously to low V tertile and medium S tertile; and so on 7 other V+S portfolios. The same we did in case of other pair combinations (V+M, M+S), so finally we obtained 27 portfolios.

Next, we constructed long/short portfolios for each of the pair combinations. The premises of certain long/short portfolios were based on existing empirical research. Therefore, we constructed following portfolios:

- 100% long high V and high M, 100% short low V and low M;
- 100% long high V and low S, 100% short low V and high S;
- 100% long high M and los S, 100% short low M and high S.

For example, the first long/short portfolio was 100% long the stocks which belonged at the same time to the high value and high momentum tertiles, and 100% short the stocks which belonged at the same time to the low value and low momentum tertiles.

Finally, we tested the described portfolios using identical procedures as described above.

3. Results and interpretation

The table below (Table 1) shows descriptive characteristics of the portfolios constructed based on fundamental characteristics.

Table 1. Descriptive statistics of class portfolios – single factors, 2000–2012

Factor	Average annual rate of return			Standard deviation			Beta*		
	Lowest	Middle	Highest	Lowest	Middle	Highest	Lowest	Middle	Highest
V	8.90%	14.26%	19.45%	47.13%	47.46%	58.82%	0.91	0.90	1.15
M	6.80%	16.21%	19.84%	54.45%	49.43%	51.52%	1.05	0.97	1.00
S	18.15%	16.21%	19.84%	63.40%	49.43%	51.52%	1.21	0.97	1.00
L	21.43%	11.99%	9.22%	57.90%	52.84%	43.44%	1.11	1.02	0.82

*Calculated against average return of all stocks (source: own computations).

The value, momentum and liquidity portfolios behaved similarly to patterns observed on the developed markets. High book-to-market ratio, high momentum and low liquidity stocks noted higher returns than other stock classes. The exception was size factor, in which case smaller stocks did not perform better than larger ones.

The Table 2 presents the analysis of long/short factor portfolios.

All the long short portfolios showed single or double digit average annual returns: the highest in case of value factor and the lowest in case of size factor. However, in most cases (with the exception of B/M market model), the excess returns were not statistically significant. We suppose that it may be due to high factor volatility and relatively short time series available.

Table 2. Descriptive statistics of class portfolios – single factors, 2000–2012

Long/short portfolios	V	M	S	L
Desrciptive statistics				
Average annual rate of return	16.4%	9.7%	2.8%	15.6%
Standard deviation	24.3%	28.2%	32.5%	39.3%
Correlation with market returns****	0.90	0.27	0.76	0.87
Market model				
B	0.52	0.10	0.48	0.91
z-stat $_{par}$	*4.36***	*0.63*	*2.58****	*2.97****
A	0.13	0.12	0.01	0.13
z-stat $_{\text{par}}$	*2.07***	*1.44*	*0.16*	*0.86*
z-stat $_{\text{non par}}$	*1.66**	*1.65**	*0.02*	*0.53*
CAPM				
B	0.53	0.11	0.49	0.90
z-stat $_{\text{par}}$	*4.47****	*0.69*	*2.66****	*3.00*
A	0.10	0.07	–0.02	0.13
z-stat $_{\text{par}}$	*1.63*	*0.85*	*–0.18*	*0.85*
z-stat $_{\text{non par}}$	*1.38*	*0.88*	*–0.45*	*0.52*

End of Table 2

* Significantly different from 0 at 10% level.

** Significantly different from 0 at 5% level.

*** Significantly different from 0 at 1% level.

**** We employed stock universe equal-weighted return as the market proxy.

Own computations.

The table below (Table 3) shows descriptive characteristics of the portfolios constructed based on pairs of the fundamental characteristics.

Table 3. Descriptive statistics of class portfolios – single factors, 2000–2012

	Average annual rate of return			Standard deviation			Beta*		
				Value factor + size factor					
	Low V	Mid V	High V	Low V	Mid V	High V	Low V	Mid V	High V
Low S	–0.22%	10.39%	22.73%	101%	52%	67%	1.32	0.91	1.81
Mid S	2.87%	15.41%	13.17%	58%	55%	55%	1.11	0.85	0.90
High S	6.00%	10.69%	14.12%	40%	39%	39%	0.69	0.54	0.45
				Value factor + momentum factor					
	Low V	Mid V	High V	Low V	Mid V	High V	Low V	Mid V	High V
Low M	1.09%	6.81%	11.44%	60%	45%	60%	1.14	0.70	1.09
Mid M	2.45%	11.36%	27.00%	37%	51%	56%	0.60	0.81	1.44
High M	15.75%	20.57%	27.86%	51%	50%	63%	1.01	0.69	1.62
				Momentum factor + size factor					
	Low M	Mid M	High M	Low M	Mid M	High M	Low M	Mid M	High M
Low S	9.61%	21.47%	26.43%	67%	55%	72%	1.31	1.36	2.08
Mid S	–1.07%	16.09%	17.68%	49%	58%	58%	0.66	1.06	1.13
High S	4.72%	6.50%	8.21%	43%	37%	39%	0.55	0.57	0.63

*Calculated against average return of all stocks (source: own computations).

The initial computations were fairly promising. The pair combinations of fundamental factors amplified the rates of return in the same direction, as the single fundamental factors do. Moreover, the patterns were similar to these observed on the developed markets. Pair combinations of high book-to-market ratio, high momentum and low size stocks noted higher returns than other stock classes.

The next table (Table 4) presents the analysis of long/short factor portfolios.

Table 4. Descriptive statistics of class portfolios – single factors, 2000–2012

Long/short portfolios	V+M	V+S	M+S
Desrciptive statistics			
Average annual rate of return	23.2%	21.9%	15.8%
Standard deviation	39.0%	47.6%	78.7%
Correlation with market returns****	0.65	0.93	0.84
Market model			
β	0.57	1.30	1.71
z-stat $_{par}$	*2.12***	*4.14****	*3.00****
α	0.27	0.22	0.28
z-stat $_{\text{par}}$	*1.98***	*1.37*	*0.98*
z-stat $_{\text{non par}}$	*2.39***	*1.08*	*0.81*

End of Table 4

Long/short portfolios	V+M	V+S	M+S
CAPM			
β	0.58	1.30	1.70
z-stat $_{par}$	*2.18***	*4.2****	*3.02****
α	0.24	0.23	0.32
z-stat $_{par}$	*1.84**	*1.52*	*1.16*
z-stat $_{non\ par}$	*1.97***	*1.18*	*0.93*

* Significantly different from 0 at 10% level.

** Significantly different from 0 at 5% level.

*** Significantly different from 0 at 1% level.

**** We employed stock universe equal-weighted return as the market proxy

(source: own computations).

Again, all the long/short portfolios delivered solid double digit average annual returns: the highest in case of the value and momentum combination, and the lowest in case the momentum and size combinations. However, in all cases (with the exception of value and momentum combination), the excess returns were not statistically significant.

Summing up, our computations showed that historically in Poland it was possible to build factor-based portfolios which outperformed the broad market portfolio. What is more, the portfolios based on combinations of two factors performed better than those based on single factor. Nonetheless, the Polish market seems too young to derive some significant statistical interference.

Conclusions

In the paper, we investigated whether the relations between four well-recognized factors: value, growth, momentum and liquidity – are present on the Polish market. We analyzed also relationships between separate factors. We performed a long/short portfolio analysis based on all stocks listed on the Warsaw Stock Exchange between 2000 and 2012. We observed that portfolios formed based on all the four factors delivered positive stock returns. Moreover, the pair combinations of fundamental factors amplified the rates of return in the same direction, as the single fundamental factors did. However, except the value factor and its combinations, the abnormal returns lacked statistical significance.

References

Amihud, Y., & Mendelson, H. (1986). Asset pricing and the bid-ask spread. *Journal of Financial Economics*, *17*, 223–249. http://dx.doi.org/10.1016/0304-405X(86)90065-6

Amihud, Y., Mendelson, H., & Lauterbach, B. (1997). Market microstructure and securities values: Evidence from the Tel Aviv stock exchange. *Journal of Financial Economics*, *45*, 365–390. http://dx.doi.org/10.1016/S0304-405X(97)00021-4

Asness, C. S. (1994). Variables that Explain Stock Returns. Ph.D. Dissertation. University of Chicago.

Asness, C. S., Moskowitz, T. J., & Pedersen, L. H. (2013). Value and momentum everywhere. *The Journal of Finance*, *68*, Issue 3, 929–985. http://dx.doi.org/10.1111/jofi.12021

Banz, R.W. (1981). The relation between return and market value of common stocks. *Journal of Financial Economics*, *9*, 3–18. http://dx.doi.org/10.1016/0304-405X(81)90018-0

Blume, M, & Stambaugh, R. (1983). Biases in computed returns: an application to the size effect. *Journal of Financial Economics*, *12*, 387– 404. http://dx.doi.org/10.1016/0304-405X(83)90056-9

Brennan, M. J., Chordia, T., & Subrahmanyam, A. (1998). Alternative factor specifications, security characteristics, and the cross-section of expected stock returns. *Journal of Financial Economics*, *49,* 345–373. http://dx.doi.org/10.1016/S0304-405X(98)00028-2

Brennan, M. J., & Subrahmanyam, A. (1996). Market microstructure and asset pricing: On the compensation for illiquidity in stock returns. *Journal of Financial Economics*, *44*, 441–464. http://dx.doi.org/10.1016/0304-405X(95)00870-K

Brown, P, Keim, D. B, Kleidon, A. W, & Marsh, T. A. (1983). Stock return seasonalities and the tax-loss selling hypothesis: analysis of the arguments and Australian evidence. *Journal of Financial Economics*, *12*, 105–128. http://dx.doi.org/10.1016/0304-405X(83)90030-2

Cambell, J. Y., Lo, A. W., & MacKinlay, A.C. (1997). *The Econometrics of Financial Markets*. Princeton University Press, Princeton: New Jersey, USA.

Capaul, C., Rowley, I, & Sharpe, W. (1993). International value and growth stock returns. *Financial Analysts Journal*, *49*, 27–36. http://dx.doi.org/10.2469/faj.v49.n1.27

Carhart, M. M. (1997). On Persistence in Mutual Fund Performance. *The Journal of Finance*, *52*, 57–82. http://dx.doi.org/10.1111/j.1540-6261.1997.tb03808.x

Chalmers, J. M. R., & Kadlec, G. B. (1998). An empirical examination of the amortized spread. *Journal of Financial Economics*, *48*, 159–188. http://dx.doi.org/10.1016/S0304-405X(98)00007-5

Chan, H., & Fa, R. (2005). Asset pricing and the illiquidity premium. *The Financial Review*, *40*, 429–458. http://dx.doi.org/10.1111/j.1540-6288.2005.00118.x

Chan, L.K.C, Hamao, Y., & Lakonishok, J. (1991). Fundamentals and stock returns in Japan. *Journal of Finance*, *46*, 1739–1764. http://dx.doi.org/10.1111/j.1540-6261.1991.tb04642.x

Chordia, T., Roll, R., & Subrahmanyam, A. (2001). Market liquidity and trading activity. *Journal of Finance*, *55*, 501–530. http://dx.doi.org/10.1111/0022-1082.00335

Chui, A. C. W., Titman, S., & Wei, K. C. J. (2010). Individualism and momentum around the world. *Journal of Finance*, *65*, 361–392. http://dx.doi.org/10.1111/j.1540-6261.2009.01532.x

Cochrane, J. C. (2005). *Asset Pricing*. Princeton University Press, Princeton: New Jersey, USA.

Cook, T., J., & Roseff, M. (1982). Size Dividend Yield and Co-Skewness Effects on Stock Returns: Some Empirical Tests, Iowa City: University of Iowa, *Working Paper Series 18*, 82–20.

Datar, V. T., Naranyan, Y. N., & Radclie, R. (1998). Liquidity and stock returns: An alternative test. *Journal of Financial Markets*, *1*, 203–219. http://dx.doi.org/10.1016/S1386-4181(97)00004-9

Davis, L., & Jaznes (1994). The cross-section of realized stock returns: The pre-COMPUSTAT evidence. *Journal of Finance*, *49*, 1579–1593. http://dx.doi.org/10.1111/j.1540-6261.1994.tb04773.x

De Bondt, W., & Thaler, R (1983). Does the Stock Market Overreact?. *The Journal of Finance 40 (3), (pp. 793–804)*. Papers and Proceedings of the Forty-Third Annual Meeting American Finance Association, Dallas, Texas. http://dx.doi.org/10.1111/j.1540-6261.1985.tb05004.x

Dimson, E., Marsh, P., & Stuanton, M. (2011). Investment style: Size, value and momentum, in `Credit Suisse Global Investment Returns Sourcebook 2011. Credit Suisse Research Institute, Zurich, 41–54.

Fama, E. F., & French, K. R. (2012). Size, Value, and Momentum in International Stock Returns. *Journal of Financial Economics*, *105 (3),* 457–72. http://dx.doi.org/10.1016/j.jfineco.2012.05.011

Fama, E. F., & French, K. R. (2008). Dissecting anomalies. *Journal of Finance*, *63 (4),* 1653–1678. http://dx.doi.org/10.1111/j.1540-6261.2008.01371.x

Fama, E. F., & French, K. R. (1998). Value versus growth: The international evidence. *Journal of Finance*, *53*, 1975–1999. http://dx.doi.org/10.1111/0022-1082.00080

Fama, E.F., & French, K.R. (1993). Common Risk Factors in the Returns on Stocks and Bonds. *Journal of Financial Economics*, *33*, 3–56. http://dx.doi.org/10.1016/0304-405X(93)90023-5

Garleanu, N. (2009). Portfolio choice and pricing in illiquid markets. *Journal of Economic Theory*, *144*, 532–564. http://dx.doi.org/10.1016/j.jet.2008.07.006

Gharghori, P., Lee, R., & Veeraraghavan, M. (2009). Anomalies and stock returns: Australian evidence. *Accounting & Finance*, *49 (3),* 555–576. http://dx.doi.org/10.1111/j.1467-629X.2009.00298.x

Griffin, J. M., Ji, X., & Martin, J. S. (2003). Momentum investing and business cycle risk: Evidence from pole to pole. *Journal of Finance*, *58*, 2515–2547. http://dx.doi.org/10.1046/j.1540-6261.2003.00614.x

Grinblatt, M., & Moskowitz, T. J. (2004). Predicting Stock Price Movements from Past Returns: The Role of Consistency and Tax-Loss Selling. *Journal of Financial Economics*, *71*, 541–579. http://dx.doi.org/10.1016/S0304-405X(03)00176-4

Haugen, R. A., & Baker, N. L. (1996). Commonality in the determinants of expected stock returns. *Journal of Financial Economics*, *41*, 401–439. http://dx.doi.org/10.1016/0304-405X(95)00868-F

Herrera, M. J., & Lockwood, L.J. (1994). The size effect in the Mexican stock market. *Journal of Banking and Finance*, *18*, 621–632. http://dx.doi.org/10.1016/0378-4266(93)00010-M

Heston, S. L., & Rouwenhorst, K.G., Weessels, R. E. (1999). The role of beta and size in the cross-section of european stock returns. *European Financial Management*, *5,* 9–27. http://dx.doi.org/10.1111/1468-036X.00077

Horowitz, J. L., Loughran, T., & Savin, N. E. (2000). The disappearing size effect. *Research in Economics*, *54 (1),* 83–100. http://dx.doi.org/10.1006/reec.1999.0207

Hu, A.-Y. (1997). Trading turnover and expected stock returns: The trading frequency hypothesis and evidence from the Tokyo stock exchange. Manuscript.

Jegadeesh, N., & Titman, S. (2001). Profitability of Momentum Strategies: An Evaluation of Alternative Explanations. *The Journal of Finance*, *56 (2),* 699–720. http://dx.doi.org/10.1111/0022-1082.00342

Jegadeesh, N., & Titman, S. (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *The Journal of Finance*, *48 (1),* 65–91. http://dx.doi.org/10.1111/j.1540-6261.1993.tb04702.x

Lam, K. (2002). The relationship between size, book-to-market equity ratio, earnings–price ratio, and return for the Hong Kong stock market. *Global Finance Journal*, *13 (2),* 163–179. http://dx.doi.org/10.1016/S1044-0283(02)00049-2

Liew, J., &Vassalou, M. (2000). Can Book-to-Market, Size and Momentum Be Risk Factors that Predict Economic Growth? *Journal of Financial Economics*, *57 (2),* 221–245. http://dx.doi.org/10.1016/S0304-405X(00)00056-8

Lintner, J. (1965). The Valuation of Risk Assets and The Selection of Risky Investments in Stock Portfolios and Capital Budget. *Review of Economics and Statistics*, *47*, 13–37. http://dx.doi.org/10.2307/1924119

Michou, M., Mouselli, S., & Stark, A. (2010). Fundamental analysis and the modelling of normal returns in the UK.

Reinganum, M. R. (1981). Misspecification of Capital Asset Pricing: Empirical Anomalies based on earning' yield and market values. *Journal of Financial Economics*, *9 (1),* 19–46. http://dx.doi.org/10.1016/0304-405X(81)90019-2

Rosenberg, B., Reid, K., & Lanstein, R. (1985). Persuasive evidence of market inefficiency. *Journal of Portfolio Management*, *11*, 9–17. http://dx.doi.org/10.3905/jpm.1985.409007

Rouwenhorst, K. G. (1999). Local returns factors and turnover in emerging stock markets. *Journal of Finance*, *54*, 143–1464. http://dx.doi.org/10.1111/0022-1082.00151

Rouwenhorst, K. G. (1998). International momentum strategies. *Journal of Finance*, *53*, 267–284. http://dx.doi.org/10.1111/0022-1082.95722

Shafana, M., Fathima Rimziya, A., & Inun, J.A. (2013). Relationship between Stock Returns and Firm Size, and Book-ToMarket Equity: Empirical Evidence from Selected Companies Listed on Milanka Price Index in Colombo Stock Exchange. *Journal of Emerging Trends in Economics and Management Sciences*, *4 (2),* 217–225.

Sharpe, W. F. (1964). Capital Asset Pricing: A Theory of Market Equilibrium under Conditions of Risk. *Journal of Finance*, *19*, 425–441.

Stattman, D. (1980). Book values and stock returns, The Chicago MBA. *A Journal of Selected Papers*, *4*, 25–45.

Zaremba, A., & Konieczka, P. (2013a). Momentum, value, size and liquidity factors on the Polish market. *Working paper*.

Zaremba, A., & Konieczka, P. (2013b). Interactions between momentum, value and size factors on the Polish market. *Working paper*.